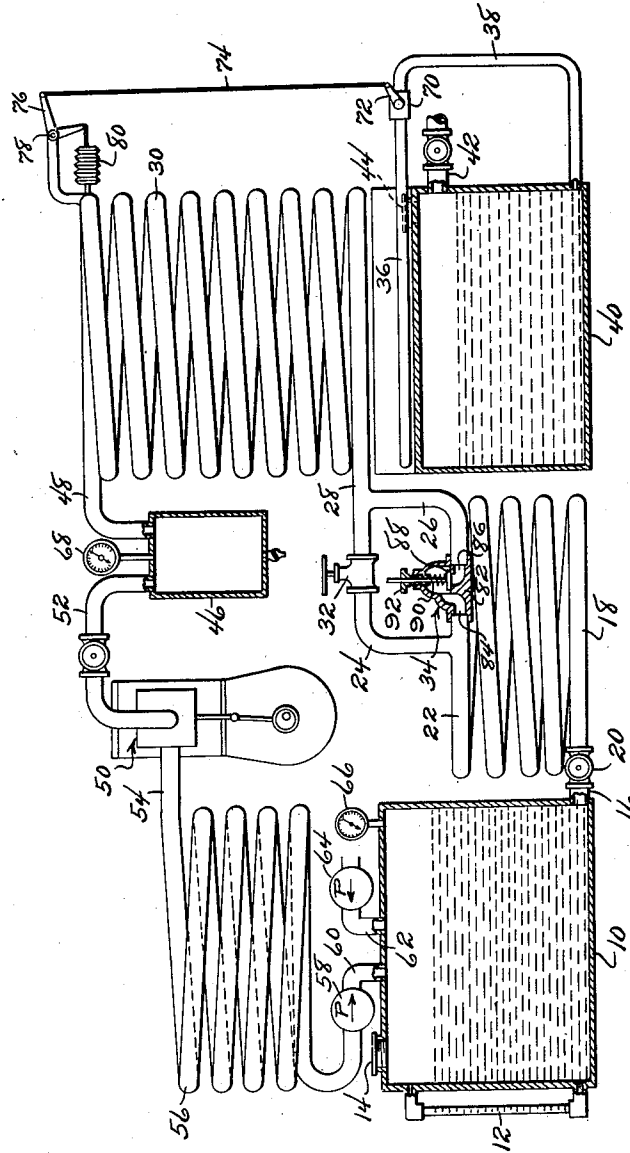


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POWER SYSTEM

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POWER SYSTEM

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4 Claims. (Cl. 122—451)

My invention relates to steam generation and control means therefor, and has among its objects and advantages the provision of an improved power system.

5 Steam generators of the flash boiler type are efficient in the generation of steam, but due to the large heating surface in comparison with the cubic capacity, such boilers are exceptionally fast in the generation of steam and violent in action, in addition to being subject to extreme fluctuations in steam pressure. Such violence and fluctuation is largely due to the lack of a sufficient volume of water to absorb temporary excesses of heat above requirements and to the absence of the cushioning effect of large steam storage capacity. These characteristics of the flash boiler have made its operation erratic and unsuitable for many purposes. In fact, such boilers are dangerous except in the hands of highly skilled operators.

Accordingly, an object of my invention is to provide a novel steam generation and control system designed to produce steam in a highly efficient manner and to effectively regulate the flow of feed water to the steam generating means. The system embodies a closed circuit so as to condense the steam and return the same back into the feed water supply. Thermostatic control means are associated with the heating means in such manner as to insure the generation of practically uniform steam pressure under varying conditions of operation and demands.

In the accompanying drawing the figure comprises a diagrammatic illustration of a steam generation and control system embodying my invention.

In the embodiment selected to illustrate my invention, I make use of a feed water tank 10 provided with a gauge glass 12 and a removable plug 14 through the medium of which the tank may be supplied with feed water. Near the bottom of the tank I connect a conduit 16 which is connected with the lower end of a cooling coil 18 through the medium of a control valve 20. The upper end of the cooling coil 18 terminates in a conduit 22 communicating with a branch line 24 and a by-pass line 26, both of which are connected with a pipe 28 of the steam generator coil 30. Interposed in the branch 24 is an adjustment valve 32, while the by-pass line 26 is provided with a by-pass valve 34.

Underneath the generator 30 I position a burner 36 connected with a fuel feed line 38 communicating with the fuel tank 40 near its bottom. The tank is provided with a valve con-

trol supply line 42, and the burner 36 is associated with a pilot light 44. Generator 30 is connected with a steam trap 46 through the medium of a pipe 48, while the steam trap is connected with an engine 50 for delivering steam thereto through the medium of a valve controlled pipe 52. Engine 50 exhausts into a pipe 54 connected with a condenser 56, the lower end of which is operatively connected with a pump 58. Pump 58 delivers condensed steam to the feed water tank 10 through the medium of a pipe 60.

Feed water tank 10 includes a pipe 62 connected with an air pressure pump 64 for placing the feed water in the tank under pressure. The tank may be provided with an air gauge 66, while the steam trap 46 is also provided with a pressure gauge 68. In the fuel line 38 I interpose a fuel regulating valve 70 connected with an arm 72, which arm is connected with one end of a link 74 having its other end connected with a bell crank 76 arranged for pivotal movement about the axis 78 through the medium of a thermostat 80 arranged in heat transfer relation with the superheated steam in the generator 30.

In operation, the generator is supplied with water through the medium of the branch 24, which branch is controlled by reason of the valve 32. The feed water in the tank 10 is placed under high air pressure. As steam is generated in the generator 30 its pressure will finally arrive at the pressure of the feed water so that the two pressures will balance. The steam pressure is maintained within proper limits by reason of the thermostat 80 which controls the fuel valve 70. Opening of the throttle of the steam engine temporarily reduces steam pressure and temperature slightly so that feed water will increase exactly in proportion to the difference between water and steam pressures, and also exactly in proportion to the work performed by the engine. At the same time, reduction of steam temperature will influence the thermostat 80 for delivering more fuel to the burner. The steam pressure at all times tends to approximate but never exceed the feed water pressure.

On the other hand, closing of the throttle causes a temporary rise of steam pressure and temperature. The thermostat 80 then cuts down the fuel supply, while at the same time and even more quickly, the by-pass valve 34 opens and discharges water through the cooling coil 18 into the feed water tank until an exact pressure balance is re-established. In fact, the generator has the benefit of the resiliency and cushion-

ioning effect of a large volume of compressed air. Thus rupture of the generator is avoided, and the thermostat is given time to reduce boiler temperature and balanced pressures are quickly re-established.

By-pass valve 34 comprises a housing 82 having ports 84 and 86 which may be brought into communicating relation by a valve 88 normally pressed to a closed position by a spring 90, the tension of which may be adjusted through the medium of a screw plug 92. Valve 88 is so arranged as to remain closed as against feed water pressure, but will open upon an increased pressure in the port 86 for establishing communication between that port and the port 84 which leads into the cooling coil 18.

The steam is effectively condensed in the condenser 56 and is returned to the feed water tank 10 through the medium of the pump 58. Pump 64 maintains the feed water tank under predetermined air pressures. Pumps 58 and 64 may be of conventional design and operated through the medium of suitable sources of power (not shown). Obviously, the engine 50 may be any one of the many types employing steam as a motive force.

Without further elaboration, the foregoing will so fully illustrate my invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service.

I claim.

1. In a power system of the type described including a feed water tank and a steam generator, conduit means connecting the tank with the generator for delivering water to the generator, means for placing and maintaining the water in said tank under air pressure equal to a predetermined working steam pressure in the generator, a valve in said conduit for controlling the flow of water from the tank to the generator, a normally closed pressure responsive by-pass means in said conduit so constructed and arranged as to open when the pressure in the generator exceeds a predetermined high value for bleeding water from generator back to the tank, and a cooler interposed in said conduit.

2. In a power system of the type described in-

cluding a feed water tank and a steam generator, conduit means connecting the tank with the generator for delivering water to the generator, means for placing and maintaining the water in said tank under air pressure equal to a predetermined working steam pressure in the generator, a valve in said conduit for controlling the flow of water from the tank to the generator, a by-pass conduit in said first-named conduit, a normally closed pressure operated valve in said by-pass conduit so constructed and arranged as to open when the pressure in the generator exceeds a predetermined high value for bleeding water from the generator back to said tank, and a cooler interposed in said first-named conduit.

3. In a power system of the type described including a feed water tank and a steam generator, conduit means connecting the tank with the generator for delivering water to the generator, means for placing and maintaining the water in said tank under air pressure equal to a predetermined working steam pressure in the generator, a valve in said conduit for controlling the flow of water from the tank to the generator, and a normally closed pressure responsive by-pass means in said conduit so constructed and arranged as to open when the pressure in the generator exceeds a predetermined high value for bleeding water from generator back to the tank.

4. In a power system of the type described including a feed water tank and a steam generator, conduit means connecting the tank with the generator for delivering water to the generator, means for placing and maintaining the water in said tank under air pressure equal to a predetermined working steam pressure in the generator, a valve in said conduit for controlling the flow of water from the tank to the generator, a by-pass conduit in said first-named conduit, and a normally closed pressure operated valve in said by-pass conduit so constructed and arranged as to open when the pressure in the generator exceeds a predetermined high value for bleeding water from the generator back to said tank.

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